



Cognitive Development

- Mathematical Thinking and Expression
- Scientific Thinking and Invention
- Social Connections
- Creative Expression

“Children are born true scientists. They spontaneously experiment and experience and reexperience again. They select, combine, and test, seeking to find order in their experiences. “Which is the mostest? Which is the leastest?” They smell, taste, bite, and touch-test for hardness, softness, springiness, roughness, smoothness, coldness, warmness: they shake, punch, squeeze, push, crush, rub, and try to pull things apart.”

R. Buckminster Fuller

The Cognitive Development domain focuses on children's natural curiosity and ability to acquire, organize, and use information in increasingly complex ways. In the search for meaning, they learn through playing, exploring, discovering, problem-solving, thinking logically, and representing symbolically.

Preschool children are developing the cognitive framework that will allow them to develop increasingly sophisticated concepts and to communicate with the world they live in. They have a growing awareness of self, family, and community. They typically learn their own names, form ideas about family roles and community helpers, and learn the names of some colors. They begin to understand that their actions have an effect on their environment and are able to think about things that are not present. They begin to understand simple scientific concepts by noticing, wondering, and exploring. They begin to ask questions as they engage in increasingly more focused explorations. They begin to demonstrate good problem-solving skills and also begin to express themselves creatively using a variety of media.

Creativity: Inspiration Takes Wing

The feeders outside the window allowed the class to study a variety of birds up close, and one day Nathan and Lucinda decided to build a feeder. As the two children got to work in the carpentry center, their teacher noticed Patima, a new student who spoke little English, quietly watching. Collecting bird replicas from the dramatic play center, the teacher used words, actions, and pictures to explain what was going on and accompanied the child to join them. A lively discussion ensued about how big the feeder needed to be. Lucinda and Patima placed the replica birds end to end and decided to make the feeder big enough for two birds to eat at the same time. Patima shared her observation that birds fling seeds while they eat, prompting the children to fetch a butter tub from housekeeping to glue onto the board. After they had proudly trooped outside to hang their feeder and fill it with seed, the children recounted the steps of the project and collaborated in drawing pictures of each step for the other children to use.

Mathematical Thinking and Expression

An early knowledge of mathematical concepts forms the basis for later learning, not just in mathematics but in other domains as well.

Widely Held Expectations

Children begin to:

- Experiment with and use numbers and counting in their play.
- Recognize and describe common shapes.
- Understand and use words that identify different positions in space (e.g., in, out, under, over).
- Recognize and duplicate simple patterns within their environment using manipulatives, art materials, body movements, etc.
- Sort, classify, and order objects on the basis of one or two attributes (color, shape, size, small to large, short to tall, etc.).
- Describe or demonstrate a sequence of events.
- Understand size and volume and make comparisons (short/tall, big/small, full/empty, length, weight, height, same, more, less).
- Participate in activities that involve non-standard measurement.
- Understand the passage of time within their daily lives (daily routines and the order of events).
- Use a variety of strategies to solve problems.
- Make and check predictions through observations and experimentation.

Strategies for Early Educators

- Make a variety of materials easily accessible for all children for the purpose of developing and refining mathematical knowledge (e.g., blocks and accessories, collections, sand and water accessories, art supplies, dramatic-play props, manipulatives, and literacy materials).
- Prompt thinking and analysis by asking open-ended questions (e.g., "How will you know how many plates you need for the guests at your party?").
- Provide large amounts of uninterrupted time for active exploration.
- Provide a variety of manipulatives that can be counted, sorted, and ordered.
- Schedule multiple counting activities in the context of daily experiences and routines.
- Read stories, sing songs, and act out poems and finger plays that involve counting, numerals, and shapes.

- Use the vocabulary of geometry to identify shapes within the classroom and surrounding environment.
- Display a picture schedule of the daily classroom routine that can be referred to throughout the day.
- Model problem-solving strategies.
- Provide opportunities to observe naturally occurring patterns within the indoor and outdoor environments. Use art materials and manipulatives with children to create patterns (e.g., weaving, painting, stringing beads, and building blocks).
- Talk with children about relevant past and future events.
- Provide opportunities to measure (e.g., “How many steps does it take to walk from the front door to your cubby?” or “How many blocks long is your arm?”).
- Provide opportunities to weigh objects (comparing the weight of common classroom objects using a balance scale).
- Participate in activities that involve making observations (e.g., rainfall or changes in temperature).

Strategies for Families

- Play with your children. Talk about what they are doing. Count and use numbers as you play together. Take advantage of every opportunity to count.
- Read books with your child related to numbers, colors, shapes, sizes, patterns, and measurement.
- Provide everyday opportunities to explore math concepts. Ask your child to sort and count groceries or the laundry, help set the table, and predict the number of cups of water it will take to fill a pitcher.
- Set aside, protect, and participate in periods of time every day for free play that is initiated by your child.
- Help children develop mathematical skills through music by singing, dancing, and playing with simple homemade instruments – oatmeal boxes, pots and pans, wooden spoons, or juice cans filled with rice or dry beans.
- Share in the planting and care of a plant or garden. Observe and measure plants as they grow. Keep a journal of your child’s observations.
- Help your child organize toys, pointing out concepts such as “in,” “on,” “under,” and “beside.”
- Allow your child to help you prepare an afternoon snack. Talk about the recipe and let him measure, pour, and stir the ingredients.
- Cook with your child. Help your child understand how to measure the ingredients and observe the changes in the ingredients as liquid is added and when heat is applied through cooking or baking.

Scientific Thinking and Invention

Scientific thinking and invention refers to the ways in which children use the process of inquiry and thinking to form ideas about the way things are.

Widely Held Expectations

Children begin to:

- Expand knowledge of their environment through play.
- Demonstrate awareness of and respect for their bodies.
- Demonstrate an awareness of seasonal changes and weather conditions.
- Identify, discriminate, and make comparisons among objects by observing physical characteristics.
- Use one or more of the senses to observe and learn about their environment.
- Observe and care for living things (e.g., classroom pets and plants).
- Demonstrate an awareness of ideas and language related to time (e.g., day and night, yesterday, today, tomorrow).
- Demonstrate an awareness of changes that occur in their environment (e.g., freezing/melting, color mixing).
- Ask questions and seek answers about their environment through active engagement with materials.
- Use simple tools for investigation of the classroom and the world.
- Manipulate their environment to produce desired effects and invented solutions to problems (e.g., deciding to attach a piece of string to the light switch so they can independently turn off the lights).
- Represent and demonstrate an understanding of discoveries (drawing, graphing, communicating, etc.).
- Make estimates based on experiences with objects (e.g., “Will this block fit in the same hole?”).
- Engage in representational thought (e.g., thinking about things that are not present).
- Understand the uses and roles of various forms of technology.
- Share responsibility by participating in the care of their environment (e.g., chores and recycling).

Strategies for Early Educators

- Engage children in observing events, exploring natural objects, and reflecting on what they learn (e.g., hang a birdfeeder outside the classroom window and use binoculars to observe the visitors; or even better, just go outdoors).

- Give children freedom to come up with their own solutions to problems. Listen to their ideas. Model the thinking process by talking out loud about a problem and reflecting on how it might be solved.
- Model language that encourages children to express wonder, pose questions, and provide evidence of discoveries.
- Create a sensory center to stimulate curiosity and exploration. Mix colors (paint, markers, food coloring, crayons) to see what happens.
- Model and teach responsible behavior. Guide children in the handling and care of pets, plants, and learning tools.
- Provide a science discovery center where children can compare the properties of objects such as shells, rocks, nests, and skeletons. Also include science materials throughout the indoor and outdoor environments.
- Provide simple tools (e.g., magnifying glass, binoculars, eyedropper, sieve, simple microscope) to use in exploration.
- Encourage scientific exploration throughout the classroom (e.g., set up sinking and floating experiments at the water table; provide cooking experiences that encourage the observation of changes in matter; equip the block center with materials that encourage explorations of vehicles and ramps).
- Take class walks throughout the year to collect a variety of objects, observe them carefully, and describe differences in shape, edges, color, texture, and size.
- Provide experiences for children to use a variety of technologies (simple tools, writing utensils, telephone, computer, etc.).
- Expose children to the scientific method of inquiry: observing, questioning, predicting, experimenting, and representing results.
- Plant gardens that change over the seasons. Provide a diversity of plants and trees that attract wildlife (e.g., butterfly bushes, trees for birdhouses, and bird feeders).
- Provide a variety of outdoor natural materials (smooth stones, shells, pinecones, acorns) that children can investigate.

Strategies for Families

- Encourage your children to experiment. Talk to them about what they discover (for example, which toys sink in the bathtub and which float).
- Listen to and build on your child's ideas. Use her interests to help plan family activities and adventures.
- Foster your child's ability to ask questions, form ideas, and speculate about what might happen "if..." Use books from the library, simple experiments, information from the internet, educational videos, and television programs to find answers to questions.

- Provide simple experiences that expand a child's sense of wonder and caring about the environment. Plant a small pot with seeds and guess how long it will take for them to sprout. Keep a record of how long it takes.
- Take your child on nature walks. Take a bag along and collect small rocks, feathers, leaves, and other objects to explore and discuss. Observe wet and dry places and how the sun warms objects it shines on.
- Pick up trash while taking a walk and deposit it in public bins. Talk about how the environment is hurt when people discard trash haphazardly.

Social Connections

Social connections refers to the ability to recognize another's perspective and respond appropriately.

Widely Held Expectations

Children begin to:

- Identify, value, and respect similarities and differences between themselves and others (gender, race, special needs, culture, language, history, and family structures).
- Understand relationships, roles, and rules within their own families, homes, and classroom.
- Participate as a member of the group in a democratic classroom community.
- Observe and talk about changes in themselves and their families over time.
- Make sense of their physical, biological, and social worlds by asking questions and engaging in pretend play.
- Demonstrate awareness of different cultures through exploration of customs and traditions, past and present.
- Identify characteristics of the places where they live and play and the relationships of those places to one another.
- Recognize and identify the roles of community helpers.
- Participate in activities to help others in the community.
- Explore, think about, inquire, and learn about the people in their classroom and community.

Strategies for Early Educators

- Equip a dramatic play area with a variety of props reflecting different aspects of families, communities, and cultures to encourage a true understanding of others.
- Change props according to the interests of the children.

- Provide literature and music that reflect a variety of cultures and traditions.
- Use literature, puppets, and role-playing to help children connect to the feelings of others.
- Give children access to a wide selection of quality multicultural books.
- Implement activities that reflect the similarities and differences among the children and families within the classroom (e.g., do body tracing and provide children with multicultural crayons to represent the variety of skin tones).
- Promote observations and discussions of things that are similar and things that are different.
- Invite community helpers into the classroom.
- Welcome families into the classroom to share their cultures, traditions, and talents.
- Explore the physical, biological, and social world, beginning with your school (e.g., a visit to another classroom) and then into the community, through field trips.
- Involve children in school and community service projects.
- Model cooperation and negotiation.
- Involve the children in the making of rules for the classroom.
- Hold class meetings to discuss concerns and issues that occur in the classroom. Encourage children to use a variety of problem-solving strategies to work through any concerns (e.g., use role-playing and puppets to help children empathize with their peers).

Strategies for Families

- For safety, teach your children their full name, telephone number, and street address and familiarize them with landmarks close to home.
- Take children on outings – to museums, parks, the library, neighborhood fire station, shops, grocery store, and laundry.
- Involve your family in school and community service projects.
- Celebrate family and community traditions. Take your child to local festivals to learn about other cultures. Start family traditions of your own.
- Encourage children to assume responsibility by asking for their input in creating a shopping list and then helping with the shopping itself. Give your child small household chores, such as putting away clothes and toys. Let them make some decisions for themselves (such as whether to brush their teeth first or put on their pajamas).
- Keep maps and globes around your house and let your children see you use them. Before taking a trip, use a

map to show your child where you are going and how you plan to get there.

- When you go somewhere, use directional terms (for example, “We need to turn left here” or “Grandma’s house is three blocks away from us; at the gas station we will turn right”).
- Share relevant work experiences with your children. Take them to your work place, if appropriate.

Creative Expression

Creative expression encompasses self-expression, originality, risk-taking, divergent thinking, and appreciation of cultural diversity.

Widely Held Expectations

Children begin to:

- Participate in art, music, drama, movement, dance, and other creative experiences.
- Use a variety of materials and activities for sensory experiences, exploration, creative expression, and representation.
- Plan and create their own drawings, paintings, and models using various art materials.
- Experience and use learning in all curricular areas, including creative arts, to reinforce learning in other curricular areas (e.g., tying an art or music project into a language development experience).
- Share experiences, ideas, and thoughts about artistic creations.
- Express interest in and show respect for the creative work of others.
- Show creativity and imagination in using materials and in assuming different roles in pretend play situations.
- Develop awareness of different musical instruments, rhythms, and tonal patterns.
- Imitate and recall tonal patterns, songs, rhythms, and rhymes.
- Respond through movement and dance to various patterns of beat and rhythm.

Strategies for Early Educators

- Encourage children to talk about and share their creative expressions with others.
- Provide access to a variety of materials, media, and activities that encourage children to use their imagination and express ideas through art, construction, movement, music, etc.
- Develop classroom procedures that encourage children to move materials from one learning center to another (such as using markers and paper in a dramatic play area).

- Use an abundance of multicultural books, pictures, tapes, and CDs in the classroom.
- Take children to museums, galleries, plays, concerts, and other appropriate cultural activities.
- Invite authors, artists, musicians, and storytellers to the classroom so children can observe firsthand the creative work of a variety of people in the arts.
- Give children opportunities to respond through music, movement, dance, dramatic play, and art (e.g., following expressive movement experiences, ask them to draw a picture of themselves and then tell you about the picture).
- Expose children to a variety of literature experiences, including poetry, musical games, and finger plays.
- Provide appropriate instruments (e.g., maracas, rhythm sticks, bells, tambourines, drums, sand blocks, shakers) for musical experimentation.
- Provide age-appropriate art materials (non-hazardous paints, modeling materials, a wide variety of paper types, writing and drawing utensils of various sizes and types, and collage materials).
- Use a variety of horizontal and vertical surfaces (easels, floor, and walls) and two- and three-dimensional objects (boxes, clay, and plastic containers) for creative expression.
- Play music, provide materials such as scarves, streamers, and bells, and make room indoors and outdoors for children to move freely.
- Encourage children to move and use their bodies in space (e.g., pretending to be a cat, a volcano, or a butterfly).
- In reading stories to children, look for words and images that suggest movement (e.g., “Can you move as softly as the wind blew?” or “This picture of a mountain shows hard, pointed shapes; can you make hard, pointed shapes with your body?”).
- Provide space and simple materials (scarves, blocks, play dough) that can be used in a variety of ways to encourage creative play. Brainstorm with children for ideas about materials to enhance their play.
- Make prop boxes to hold basic materials for pretend play (e.g., props for a beauty parlor, post office, pet store, doctor’s office).
- Use community outings to introduce new ideas and concepts. Open the classroom to members of the community.
- Demonstrate that you value children’s creative expressions by displaying their work in the classroom at their eye level.

Strategies for Families

- Encourage your children to talk about what they create and take time to listen to their thoughts.
- Take them on outings to museums, art galleries, and festivals. Ask what they saw that they liked best, and why.
- Bring home books, tapes, and videos involving creative expression. (Much is available free at public libraries.)
- Create an art box that contains markers, crayons, scissors, paper, tape, and play dough.
- Collect magazines for your child to cut out pictures. Fill a box with string, leftover wallpaper, dress patterns, tissue paper, paper towel rolls, small boxes, fabric, or other such items children can use creatively.
- Sort through old clothing and accessories for dress up and pretend play. Encourage pretend play by keeping an old blanket or sheet and some large boxes on hand for creating tents and other hideouts.
- Listen with your child to appropriate CDs, tapes, and the radio to provide musical experiences that span a variety of tastes. Encourage your child to move to the music. Dance with your child.
- Be a responsive and appreciative audience. When you watch your children moving, name what you see and join them. Say, for example, “You’re making circles with your arms. I want to make circles, too!”